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CORNING INCORPORATED
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CORNING, NY 14831

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GEORGE E. BERKEY, DANA C. BOOKBINDER,
RICHARD M. FIACCO, JEFFREY T. KOHLI,
and DALE R. POWERS

Appeal 2008-2390
Application 10/663,475
Technology Center 1700

Decided: November 13, 2008

Before CHARLES F. WARREN, THOMAS A. WALTZ, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

This is an appeal from the Examiner's final rejection of claims 1-14 and 16-19, the only claims remaining in the application. 35 U.S.C. § 134. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

The invention relates to a method of treating optical fiber preforms with deuterium. (Spec. [0001].) More specifically, the method of the invention is "used to provide reduced levels of hydroxyl ions or OH ions in an optical waveguide preform, such as an optical fiber preform." (Spec. [0037].)

Independent claim 1 is illustrative of the claimed process:[1]

> 1. A method of forming an optical fiber preform, the method comprising:
>
> providing a consolidated glass preform precursor body having an outer surface;
>
> depositing a layer of silica soot onto the outer surface of the consolidated glass preform precursor body to form a composite preform comprised of a consolidated glass portion and a silica soot portion; and
>
> in a deuterium-exposing step, exposing the composite preform to an atmosphere containing a concentration of D_2 or D_2O or a mixture of D_2 or D_2O for a time and at a temperature sufficient to cause the D_2 or D_2O to penetrate the consolidated glass portion without entirely pervading the consolidated glass portion.

[1] Reproduced from the Claims Appendix to Appellant's Brief on Appeal ("Br.", filed October 11, 2007). Our decision also makes reference to the Examiner's Answer ("Ans.", mailed November 28, 2007).

The Examiner relies upon the following references in rejecting the appealed claims:

Gilliland	4,810,276	Mar. 7, 1989
Burrus	4,515,612	May 7, 1985

Claims 1-14 and 16-19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Gilliland and Burrus.[2] Appellants, in the Appeal Brief, argue claims 1-5, 8, 10, 16, and 18-19 as a group. (Br. 12-19.) Accordingly, we select representative claim 1 to decide the appeal as to this group of claims. 37 C.F.R. § 41.37(c)(1)(vii). Appellants have separately argued and, therefore, we separately consider the patentability of each of dependent claims 6, 7, 9, 11-14, and 17.

The Examiner finds that Gilliland discloses a method of forming a composite fiber preform comprising depositing a layer of silica soot upon the outer surface of a consolidated glass preform body. (Ans. 4-5.) The Examiner concedes that Gilliland does not teach a deuterium-exposing step as claimed. (Ans. 5.) However, the Examiner finds that Burrus teaches exposing preforms to deuterium for the purpose of lowering fiber loss. (Ans. 5.) The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the preform manufacturing process of Gilliland by employing a deuterium-exposing step as taught by Burrus for the purpose of lowering fiber loss. (Ans. 5.) The Examiner further contends that the resultant, modified preform manufacturing process would inherently be carried out "for a time and temperature sufficient to cause the D_2 or D_2O to penetrate the

[2] The rejection of claims 4-11 and 16 under 35 U.S.C. §112, second paragraph has been withdrawn. (Ans. 3.)

consolidated glass portion without entirely pervading the consolidated glass portion." (Claim 1, *see* Ans. 5-6.)

Appellants contend that the Examiner's proposed motivation to combine Gilliland and Burrus is based on improper hindsight reasoning. (*See* Br. 3, 6.) Appellants further argue that even if Gilliland and Burrus were properly combined, the claimed invention would not result. (Br. 3.) Specifically, Appellants contend that the limitation "for a time and temperature sufficient to cause the D_2 or D_2O to penetrate the consolidated glass portion without pervading the entire [consolidated] glass portion" is not "mentioned or suggested" by the cited references, and the Examiner's inherency theory regarding the limitation is not properly based in fact. (Br. 7.)

ISSUES

Based on the contentions of the Examiner and the Appellants, the issues presented for our review are:

(1) Have Appellants shown that the Examiner reversibly erred by failing to establish proper motivation to combine Gilliland and Burrus?

(2) Have Appellants shown that the Examiner failed to establish a prima facie case of obviousness because the facts and reasons relied on by the Examiner are insufficient to show that application of Burrus' deuterium-exposing step in Gilliland's preform manufacturing process would inherently occur "for a time and temperature sufficient to cause the D_2 or D_2O to penetrate the consolidated glass portion without entirely pervading the consolidated glass portion"?

(3) Have Appellants shown that the Examiner reversibly erred in concluding that the subject matter of dependent claims 6, 7, 9, 11-14, and 17

would have been obvious to one of ordinary skill in the art at the time of the invention in view of the combined teachings of Gilliland and Burrus?

We answer each of these questions in the negative for the reasons discussed below.

FINDINGS OF FACT ("FF")

1) According to the Specification, the Inventors "have found that uncontrolled exposure to a deuterium-containing compound can result in overdosing the glass portion 10 of the composite optical fiber preform 30 with deuterium-containing compound to such an extent that the attenuation of light signals passing through optical fiber drawn therefrom is undesirably or unacceptably increased." (Spec. [0047].) The inventors have found that this problem can be avoided by ensuring that exposure of the composite optical fiber preform to the exchange atmosphere comprising deuterium-containing compound occurs for a time and at a temperature sufficient to promote exchange of the hydrogen but "for a time short enough and at a temperature sufficiently low enough to prevent deuterium compound from penetrating deep into the center of the glass portion 10." (Spec. [0048].) More specifically, the Specification states that exposure to the exchange atmosphere is preferably "terminated before any deuterium-compound reaches the centerline of the composite optical fiber preform," and even more preferably, "prior to any deuterium compound being introduced beyond a desired depth (or beyond a desired thickness) into the composite preform." (Spec. [0049].)

2) According to the Specification, the composite optical fiber preform is preferably "exposed to the exchange atmosphere such that

greater than 50% of the OH compound in the glass portion is exchanged with OD compound, as measured, for example, on a weight or volume basis, or as reflected in a reduction in the peak OH concentration." (Spec. [0050].) "More preferably, greater than 70% of the OH compound is exchanged with OD compound in the glass portion 10. In preferred embodiments, less than 100% of the OH compound is exchanged with OD compound in the glass portion 10." (Spec. [0050].)

3) According to the Specification, "the exchange step comprises heating the composite optical fiber preform 30 to an exchange temperature in the range of about 600 ºC to less than the consolidation temperature of the soot layer . . ., and still more preferably between about 850 ºC and about 1250 ºC." (Spec. [0052].)

4) According to the Specification, "the exposure to the deuterium atmosphere during the exchange step occurs for greater than about 30 seconds, more preferably greater than about 1 minute. In one preferred embodiment, deuterium exposure lasts for greater than about 10 minutes." (Spec. [0053].)

5) According to Gilliland, in a conventional outside vapor deposition ("OVD") process, "glass particles, often referred to as soot, are directed laterally or axially onto a starting member. . . . A fiber having a core and cladding is usually formed by depositing a cylindrically-shaped preform of core glass particles and cladding glass particles and consolidating that preform to form a draw blank which can be drawn into a fiber." (Gilliland, col. 1, ll. 21-29.) Gilliland states that a drawback of this process is that "[d]uring the

consolidation process, dopant from the core portion of the porous preform can migrate through the pores to the cladding portion, thereby creating a dopant-depleted region at the edge of the core and a corresponding dopant-rich region in the adjacent cladding. The resultant core-cladding interface is not sufficiently abrupt for certain applications." (Gilliland, col. 1, ll. 29-36.) Gilliland's invention is directed to overcoming this problem. (Gilliland, col. 1, ll. 39-43.)

6) Gilliland's inventive method "comprises forming a glass rod the composition of which includes a base glass and at least one dopant, the concentration of which changes radially from an acceptable level within the rod to an unacceptable level in a surface region of the rod. The rod can be formed, for example, by depositing glass particles on a mandrel, removing the mandrel, and consolidating the resultant porous body to form a non-porous rod." (Gilliland, col. 1, ll. 44-52.) Gilliland removes the unacceptable, dopant-poor surface region created by out-diffusion of dopant during consolidation, preferably by immersing the rod in an etchant. (Gilliland, col. 1, ll. 52-55.) Gilliland then applies a layer of cladding glass to the rod. The composition of the cladding glass is different from that of the rod; for example, it could be cladding glass having a refractive index lower than that of the rod. Prior to applying the cladding glass, the rod can be heated and stretched to form an elongated core bait rod. The cladding layer can be applied by depositing a plurality of layers of cladding glass particles on the surface of the core bait rod and heating the resultant assembly to consolidate the cladding glass particles. (Gilliland, col. 1, l. 44-col. 2, l. 3.)

7) Burrus discloses a method for reducing attenuation of electromagnetic radiation traveling through an optical fiber, in particular, "attenuation due to absorption by impurities present in the guiding region of the fiber" (Burrus, col. 1, ll. 27-30), i.e., the core of the fiber (Burrus, col. 4, ll. 20-23). Burrus' method is based on the discovery "that the known process of deuterium/hydrogen exchange in vitreous silica containing OH can be applied to silica-based optical fibers and to optical fiber preforms (i.e., the bodies from which fibers are drawn)." (Burrus, col. 2, ll. 19-24.) According to Burrus, exposing preforms to deuterium lowers fiber loss . . . without significantly affecting important fiber parameters such as refractive index profile, or numerical aperture, bandwidth, scattering loss, and absorption due to species other than OH. (Burrus, col. 2, ll. 24-35.)

8) According to Burrus, "the mode of practicing the invention typically depends on the method used for fabrication of the fiber, more particularly, the method used for fabrication of the body from which the fiber is drawn, the so-called preform." (Burrus, col. 4, ll. 3-7.) Burrus specifically notes that "[m]ethods for manufacturing optical fiber preforms and for producing optical fibers therefrom, as well as fiber designs and properties of structures embodying these designs, are well known in the art and will not be discussed herein." (Burrus, col. 2, ll. 8-12.)

9) Burrus explains that "[t]he diffusion characteristics of deuterium in glassy silica are very similar to those of hydrogen. . . . Since the required diffusion distance depends on the details of the sample in which the exchange is to take place, it is generally not

possible to set quantitative limits on this distance. . . . The amount of deuterium incorporated into the bulk of a sample is, inter alia, a function of the partial pressure of deuterium present in the atmosphere in contact with the sample." (Burrus, col. 2, l. 65-col. 3, l. 17.)

10) Burrus explains that "[w]hen diffusing deuterium atoms encounter OH they can undergo a reversible exchange reaction with the bound hydrogen. This reaction typically is very efficient, thus the number of deuterium atoms need not greatly exceed the number of bound hydrogen atoms in order to get substantial D/H exchange. . . . The de-bonded hydrogen is mobile and can, unless undergoing the reverse reaction, encountering a trapping site, or becoming relatively immobile due to a drop in the sample temperature, diffuse to a surface and be lost from the sample. Any OD incorporated into the sample contributes little to absorption of light in the relevant wavelength regime since the specific absorption due to OD is about two orders of magnitude less than that of OH in the relevant wavelength region." (Burrus, col. 3, ll. 19-40.)

11) According to Burrus, the D/H exchange reaction typically can proceed at any temperature above the minimum temperature, typically 300 °C, up to, and even above, the softening temperature of the glass. (Burrus, col. 3, ll. 50-57.)

12) Burrus teaches that preforms having a consolidated deposit may be contacted with an atmosphere containing deuterium "for a length of time sufficient to permit diffusion of deuterium for a sufficient distance into the deposit." (Burrus, col. 5, ll. 28-31.)

13) Burrus teaches that deuteration "can take place at any appropriate stage of the article manufacturing process, for instance, after the formation of the tube or rod." (Burrus, col. 6, ll. 34-37.)

14) Burrus teaches deuteration exposure times ranging from 30 seconds (Burrus, col. 2, ll. 64-65) to 90 hours (Burrus, col. 7, ll. 8-10).

CLAIM INTERPRETATION

Our consideration of the issues in this Appeal begins with interpretation of the claim language in dispute. *See Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1567-68 (Fed. Cir. 1987) (In making a patentability determination, analysis must begin with the question, "what is the invention claimed?" since "[c]laim interpretation, . . . will normally control the remainder of the decisional process."). Thus, we first consider the scope and meaning of the claim 1 phrase "exposing the composite preform to an atmosphere containing a concentration of D_2 or D_2O or a mixture of D_2 or D_2O for a time and at a temperature sufficient to cause the D_2 or D_2O to penetrate the consolidated glass portion without entirely pervading the consolidated glass portion."

During examination, claims terms must be given their broadest reasonable construction consistent with the Specification. *In re Icon Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007)("[T]he PTO must give claims their broadest reasonable construction consistent with the specification. . . . Therefore, we look to the specification to see if it provides a definition for claim terms but otherwise apply a broad interpretation.").

Interpreting the claim language "for a time and temperature sufficient to cause the D_2 or D_2O to penetrate the consolidated glass portion without entirely pervading the consolidated glass portion" in light of the

Specification, we determine that the broadest reasonable interpretation of claim 1 requires a deuterium exposure step in which conditions (e.g., time and temperature) are controlled such that no deuterium-compound reaches the centerline of the composite optical fiber preform. (*See* FF 2, 3.) We decline to read the claim language as limiting the nature of the conditions, i.e., we do not view the claim language as limited to a specific temperature range or maximum exposure time (*see* FF 4). Rather, we are in agreement with the Examiner that any type of condition, including elimination of D_2 or D_2O by conversion or reaction, may be employed to ensure that no deuterium-compound reaches the centerline of the composite preform. (*See* Ans. 6; FF 10.)

PRINCIPLES OF LAW AND ANALYSIS

Having determined the scope and meaning of the claim language in dispute, we now address the issues presented in this Appeal.

Issue (1):

Appellants contend that the Examiner failed to properly establish motivation to combine the teachings of Burrus and Gilliland for the following reasons: (1) there is no indication in Burrus that the disclosed deuterium treatment can be applied to an OVD preform manufacturing process (i.e., the process used in Gilliland) (Br. 4) and that such treatment would reduce fiber loss in an OVD process (Br. 6), (2) Burrus teaches away from applying a deuterium treatment at any time in a preform process other than MCVD (Br. 4-5), and (3) Burrus teaches away from applying a deuterium treatment to an unconsolidated deposit (Br. 6).

"When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of

ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103." *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1742 (2007). "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). *See also, In re Fritch*, 972 F.2d 1260, 1264-65 (Fed. Cir. 1992) (reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in this art would have reasonably been expected to draw therefrom); *In re Heck*, 699 F.2d 1331, 1332-33 (Fed. Cir. 1983) (disclosure of a reference may be relied upon for all it contains, and is not limited to what is disclosed in the examples).

Contrary to Appellants' contention, we are in agreement with the Examiner that Burrus clearly suggests that the disclosed deuterium exchange process may be employed in conjunction with any known method for manufacturing optical fiber preforms. (FF 7, 8, 13.) Moreover, we are in agreement with the Examiner that it would have been within the skill level of the ordinary artisan at the time of the invention to have modified known preform processes to include Burrus' deuterium treatment step (Ans. 9) and, in fact, Burrus suggests the same (FF 8, 9). Burrus clearly indicates that deuterium exchange may be used as an additional step in known preform processes, providing the added benefit of reduced fiber loss "without

significantly affecting important fiber parameters such as refractive index profile" (Burrus, col. 2, ll. 31-32). (FF 7.) Therefore, we find that the Examiner provided a reasonable basis to conclude that one of ordinary skill in the art would have been motivated to employ Burrus' deuterium exchange process in Gilliland's preform fabrication process (FF 6) to reduce fiber loss, especially since Burrus indicates that parameters important to Gilliland, e.g. refractive index (FF 5), will not be adversely affected (FF 7).

Issue (2):

Appellants also argue that the Examiner failed to provide sufficient facts and reasons to establish that application of Burrus' deuterium-exposing step in Gilliland's preform manufacturing process would inherently occur "for a time and temperature sufficient to cause the [D_2 or D_2O] to penetrate the consolidated glass portion without pervading the entire [consolidated] glass portion" (Br. 7.)

"The inherent teaching of a prior art reference, a question of fact, arises both in the context of anticipation and obviousness." *In re Napier*, 55 F.3d 610, 613 (Fed. Cir. 1995). Where the Examiner establishes a reasonable assertion of inherency and thereby evinces that a claimed process appears to be identical to a process disclosed by the prior art and/or that the products claimed by the applicant and disclosed in the prior art appear to be the same, the burden is properly shifted to the applicant to show that they are not. *See In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990); *In re Best*, 562 F.2d 1252, 1254-56 (CCPA 1977).

Contrary to Appellants' contention, we find that the Examiner provided a reasonable basis to conclude that the combined teachings of Gilliland and Burrus would inherently result in the method as claimed.

Burrus specifically contemplates a deuterium treatment in which "[a]ny OD incorporated into the sample contributes little to absorption of light in the relevant wavelength regime" (Burrus, col. 3, ll. 36-38). (FF 10; *see* FF 1 (explaining that overdosing the glass portion of the composite optical fiber preform with deuterium-containing compound can result in an unacceptable increase in attenuation of light signals passing through optical fiber drawn therefrom)). Burrus notes that the reaction typically is very efficient, thus the number of deuterium atoms need not greatly exceed the number of bound hydrogen atoms in order to get substantial D/H exchange. (FF 1; *see* FF 3 (noting that exchange of OH with OD compound is preferably greater than 70%, but less than 100%).) Though not specifically stating that the deuterium compound should not entirely pervade, Burrus clearly indicates that diffusion of deuterium should only occur for a specified, or limited distance into the deposit. (FF 12.) Moreover, the deuteration exposure times and temperatures used by Burrus overlap those of Appellants. (*Compare* FF 11, 14 *with* FF 4.) Thus, it reasonably appears that one of ordinary skill in the art at the time of the invention, applying a deuterium-exposing step in Gilliland's preform manufacturing process based on Burrus' disclosure, would perform such step in a manner that would inherently prevent overdosing of the glass portion with deuterium-containing compound, i.e., prevent deuterium from reaching the center line of the composite optical fiber preform. (*See* claim interpretation, *supra*, p. 11.)

Issue (3):

We have separately considered Appellants' arguments for patentability of each of dependent claims 6, 7, 9, 11-13, and 17 (Br. 7-10.) However, we find that the weight of the evidence in the record before us

weighs in favor of the Examiner's conclusion of obviousness for the reasons well-stated in the Answer (*see* Ans. 7-8 and 13-17).

In traversing the rejection of dependent claims 6, 7 (Br. 7-8), 9 (Br. 8) and 17 (Br. 10), Appellants narrowly focus on selected passages within *either* Gilliland *or* Burrus. However, the test for obviousness is what the *collective teachings* of the prior art would have suggested to one of ordinary skill in the art. *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991); *Keller*, 642 F.2d at 425. *Cf. In re Hedges*, 783 F.2d 1038, 1041 (Fed. Cir. 1986) (*quoting In re Wesslau*, 353 F.2d at 241) ("It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art."). In our view, the Examiner's Answer provides sufficient factual findings and reasons to support a conclusion that the recited features in each of claims 6, 7, 9 and 17 are disclosed or suggested by the combined teachings of Gilliland and Burrus (*see* Ans. 7, 8, 13 (noting a citation to a specific column and lines in a reference "is an indication that one should 'see' the passage and combine it with all the prior discussion of the prior art"), and 16-17). Appellants' arguments fail to refute the facts and reasons relied on by the Examiner and, therefore, fail to establish reversible error in the Examiner's rejection of claims 6, 7, 9, and 17 as unpatentable over Gilliland in view of Burrus

Similarly, with respect to claims 11-14, Appellants focus on the Examiner's failure to identify explicit teachings of the recited claim features (Br. 8-10). However, Appellants have not refuted the Examiner's determination that one of ordinary skill in the art would have been familiar

with OVD fiber manufacturing processes and would have had the necessary skills to modify and optimize the explicitly disclosed steps of Gilliland and Burrus, thereby achieving Appellants' claimed invention (*see* Ans. 7-8 and 11-17 (*e.g.*, Ans. 14, "It remains undisputed that 'it is well-known to use an inert purge gas in the fiber making art between steps. . . .' Appellant fails to point out how . . . the Official Notice is improper.")). *See KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740-41 (2007) ("[T]he analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.").

CONCLUSIONS

Appellants have not shown that the Examiner reversibly erred by failing to establish proper motivation to combine Gilliland and Burrus.

Appellants have not shown that the Examiner failed to establish a prima facie case of obviousness because the facts and reasons relied on by the Examiner are insufficient to show that application of Burrus' deuterium-exposing step in Gilliland's preform manufacturing process would inherently occur "for a time and temperature sufficient to cause the D_2 or D_2O to penetrate the consolidated glass portion without entirely pervading the consolidated glass portion."

Appellants have not shown that the Examiner reversibly erred in concluding that the subject matter of dependent claims 6, 7, 9, 11-14, and 17 would have been obvious to one of ordinary skill in the art at the time of the invention in view of the combined teachings of Gilliland and Burrus.

ORDER

The decision of the Examiner rejecting claims 1-14 and 16-19 under 35 U.S.C. § 103(a) as being unpatentable over Gilliland in view of Burrus is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

PL Initial:
sld

CORNING INCORPORATED
ST-TI-3-1
CORNING, NY 14831